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ABSTRACT

The ability of English as a second language (ESL) readers to comprehend different types of nominal compounds in English technical literature was investigated. College students were asked to recover the meaning of 73 nominal compounds in two technical English language articles on occupational health and safety. The intermediate and advanced ESL readers did not perform as well as native English speaking control subjects. Based on the results, suggestions are made for teaching about nominal compounds. In teaching the reading of technical literature in a second language, nominal compounds should be emphasized because of their frequency, complexity, and rarity in the learners' native language. It is suggested that nominal compounds should be classified and taught according to complexity and function. Nominal compound categories characterized by single-function, parallel-function, multi-function, ellipsis, and syntactic or polysemous ambiguity are identified in ascending order of complexity. Teaching materials should be drawn from the students' technical field and presented in a workbook format, and nominal compounds should always be presented in context in authentic materials. (RW)

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A COGNITIVE APPROACH TO ENGLISH NOMINAL COMPOUNDS

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Nominal compounds (NCs) are commonplace in everyday English, examples being football match (= a match (game) played with a football), income tax return (= a return (form) on which you have to declare your income, on which you are then taxed), and garden chair (= a chair used in the garden). An NC, then, is a single entity that is described by a compound of successive nouns. Sometimes the compound may incorporate an adjective or verb-form, e.g. heat-resistant table, computer-guided missile[(1)].

In professional English, NCs are even more frequent, and pose severe problems to the non-native reader (and even, at times, the native reader). This article outlines the results of research into readers' degrees of difficulty in recovering the meanings of different types of NC, draws pedagogic implications, and suggests appropriate teaching materials.

The Importance of Nominal Compounds in Professional Reading

The three major reasons for paying attention to NCs in teaching the reading of professional literature are NC frequency, rarity in the reader's L_1, and complexity. Sager (this volume) reports the following frequencies :

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(1) Strictly speaking, such instances are multiple compounds, (Sager, Dungworth and McDonald, 1980), rather than nominal compounds. But for purposes of this study, I include as nominal compounds those which start and finish with a nominal, and incorporate an adjective, adverb or participle.

NC / REGISTER	% FREQUENCY OF OCCURRENCE				
	all	2-nominal	3-nominal	4-nominal	5-nominal
Technical English	15.37	6.05	6.84	0.61	0.61
Medical English	9.76	4.15	2.36	0.82	0.22
General English	0.87	0.38	0.42	0.04	0.03

These figures summarize the number of words per 100 involved in an NC, first occurrence only. They show clearly the much higher incidence in professional reading, and hence the problem for an L_2 reader attempting to read the literature of his specialist field, after learning to read only general English texts.

In addition to frequency, a further problem is that the linguistic form NC is usually absent in the reader's L_1. For example, Spanish says progamador de computadoras for computer programmer, and French says un bloc en forme de cylindre d'un alliage d'aluminium for aluminium alloy cylinder. Hence (unlike the native English reader), the non-native reader has not internalised a set of recovery procedures, and so cannot transfer them to operate on English NCs.

And third, English NCs cover an extremely wide variety of function and form. The functional categories of NCs have been described by a number of commentators, including Sager, Dungworth and McDonald (1980) and Olsen (1980). Perhaps the best-known functional categorization is Bartolic's (1978), who distinguishes between:-

- operating principle, e.g. gravity conveyor
- working substance in the operation, e.g. water turbine
- means of operation, e.g. foot brake
- characteristic working part, e.g. jet condenser
- person who formulated the working principle, e.g. diesel engine
- materials used, e.g. copper wire
- purpose, e.g. transmission lines
- location, eg. flue damper
- professional engagement of person/industry, e.g. research worker

- shape or form, e.g. butterfly valve
- B of A, e.g. cylinder liners

Apart from variety of function, NCs also show considerable variety of form - as we shall shortly see.

Research into NC Recovery

In order to find out which functional and formal categories of NC posed the greatest problem to non-native readers, I took two journal articles, and had readers recover the meanings of selected NCs. The articles were both from the September 1981 Journal of Occupational Accidents, viz.

Strandberg and Lanshammar[1]: "The Dynamics of Slipping Accidents"
Burdekin: "The Investigation of Structural Failures in Steel Buildings, Cranes and Bridges".

An NC frequency analysis showed:

	Strandberg & Lanshammar	Burdekin	TOTAL
Words in Article	2908	3656	6564
Words involved in NC, including Duplications	598 (20.56%)	405 (11.08%)	1003 (15.28%)
Words involved in First Occurrence NC	421 (14.48%)	314 (8.59%)	735 (11.20%)

And on analysis of form (including internal Adjective, Adverb and Particle) showed:

Composition (First Occurrence)	Category	##	Sub-total		Example
			##	%	
2-nominal	NN	179			gait cycle
	GN	7			slipping accidents
	NG	28			surface patterning
	NPN	2			heat affected zone
	NAdjN	3			material independent modes
			219	74.41	

(1) Swedish

Composition (First Occurrence)	Category	##	Sub-total		Example
			##	%	
3-nominal	NNN	32			accident event sequence
	NNG	2			force plate soaping
	NGN	5			force measuring platform
	GNN	4			sliding velocity valve
	NNAdjN	1			body weight static force
	NNPN	1			gusset plate sheared edge
	NPNG	1			heat affected zone cracking
	NPNN	2			computer based information system
	NNAdvN	1			heel edge forward velocity
			49	16.72	
4-nominal	NNNN	5			steel box girder bridges
	NNGN	1			laboratory trial tightening experiments
	NNNPN	1			(high) strength steel shot fired pins
			7	2.39	
5-nominal	NNNNN	1			airport building roof truss failures
			1	0.34	
ellipsis / = and or or	NN/N	5			human slips and falls
	NN/G	1			human gait and slipping
	GN/N	2			sliding velocity and distance
	NN/NN	2			swing leg and arm motions
	N/NN	3			force and motion data
	N/NNN	1			Road and Traffic Research Institute
	N/PNNN	1			Shoe and Allied Trades Research Association
	NAdj/NN	2			hardness, tensile and fracture tests
	NN/GN	1			heat treatment and manufacturing processes
			18	6.14	
			294		

NCs in these two journal articles were categorized functionally as follows:

FUNCTIONAL CATEGORY	EXAMPLE	NUMBER OF OCCURRENCES IN SINGLE-FUNCTION NC	NUMBER OF OCCURRENCES IN MULTI- OR PARALLEL-FUNCTION NC	TOTAL	
				NUMBER	%
B of A	brewery warehouse	81	28	109	31.5
means	heat affected zone	12	12	24	6.9
purpose	measurement techniques and criteria	44	19	63	18.2
location	roof trusses	12	5	17	4.9
materials used	steel boxes	11	5	16	4.6
cause and effect	frost damage	35	9	44	12.7
duration or extent	tension areas	18	3	21	6.1
characteristic	striation markings	7	4	11	3.2
shape or form	web plates	2	3	5	1.5
representation	force and motion data	19	7	26	7.5
		246	100	346	100

In order to investigate the L_2 reader's comparative difficulties in recovering the meanings of different categories of NC, the two articles concerned were Xeroxed in their entirety, the text appearing in the centre third of a side-on foolscap sheet. 73 NCs representative of the formal and functional categories just described were circled. Readers were asked to recover the meaning of each NC by writing its expansion in the margin. Three groups of student participated, all from the Department of Occupational Health and Safety, University of Aston in Birmingham:

(1) A multi-function NC is one which, on recovery, **contains two or more different** functions, e.g. rail-suspended safety harness = a harness for the purpose of improved safety, that works by means of a suspended rail. A parallel-function **contains two or more instances of the same function.**

L2 intermediate (6-month Certificate)

L? advanced (MSc)

L1 advanced (MSc)

Stude.ts performed the task without time restrictions. Students' completed sheets were analysed for their success or failure in recovering the meanings of the circled NCs. (Two lecturers in the Department of Occupational Health and Safety also completed the task, so as to provide a yardstick in case of doubt.) An extract from the results is:

	L2 INTER-MEDIATE (n = 8)	L2 ADVANCED (n = 5)	L1 (n = 6)	TOTAL (n = 19)
1. friction measurement (NN) = measurement of friction ..... ← OF —●	100%	100%	100%	100%
2. slipping accidents (GN) = accidents caused by slipping ..... ← CAUSE —●	37	80	100	68
3. material defects (NN) = defects caused by the use of sub-quality materials ← CAUSE —●	25	60	33	37
4. force application time (NNN) = the extent of time during which force is applied ← OF —— EXTENT —●	37	100	83	68
5. force and motion data (N/NN) = data which represents motion, and data which represents force ← REP.-● 1 ← REP.——● 2	75	100	100	89
6. slipping research and prevention (GN/N) = research in order to investigate slipping, and the prevention of slipping) ← PURPOSE —● 1 ←—— OF ——● 2	37	80	100	68
7. heat affected zone cracking (NPNG) = cracking over a specific zone, the zonal cracking having been caused by heat) ← CAUSE —— LOC.—●	25	40	67	42
8. rail-suspended safety harness (N-PNN) = a harness to improve safety, which operates by suspension from a rail ←MEANS —— PURPOSE —●	63	100	100	84
9. steel box girder bridges (NNNN) = bridges constructed of girders in a box shape, the girders being constructed of steel) ←MAT.— SHAPE—MEANS —●	50	80	100	73
10. laboratory trial tightening experiments (NNGN) = experiments to find out the consequences of over-tightening nuts, this tightening being carried out by means of trials in the laboratory ← LOC.— MEANS —— PURPOSE —●	25	20	83	42
11. heat treatment and manufacturing processes (NN/GN) = processes for manufacturing steel, and processes for treating steel by means of heat ← PURPOSE —● 1 ←MEANS— PURPOSE ——● 2	13	60	50	37
12. (additional) welding residual stress (GAdjN) = residual stress caused by additional welding ← CAUSE ——●	13	20	50	26

Pedagogic Implications

The major pedagogic implications arising from the results as a whole, appear to be:

1. In our concern with getting the L_2 reader to recover the meaning of an NC, we should not overlook the fact that many (especially weaker) readers simply do not recognize that a string of words is an NC.
2. Equally basic, the principle of right-to-left tracking needs to be specifically taught.
3. The results show that there is little problem with the B of A structure. This is presumably because it is by far the most common, and is often in fact written in recovered (e.g. examination of the fracture surfaces) rather than NC form.
4. The need, therefore, is to build up the reader's range of other functional categories, so that if B of A is not successful, the reader can search his store of categories for the one that works. (After all, this is how the native reader is able to recover NCs.)
5. NC recovery should be taught in context, for often it is only the context that confirms the NC's underlying meaning. (e.g. 4, 8, 9, 10, 12)
6. Special attention should be paid to NCs of 3 or more parts, because length correlates with formal and functional complexity. In such cases, a first-stage approach is to encourage the reader to "chunk" the NC by searching for 2-part semantic bonds, e.g. (airport building)(roof truss) failures.
7. NCs that are syntactically ambiguous are a problem, especially for the weak L_2 reader. (e.g. 3,7)
8. NC ellipsis is a major area of concern, and should be given special attention. (e.g. 5,6,11)
9. Multi-function NCs (e.g. 4,7,8,9,10) are more difficult to recover than parallel-function.

Suggestions for NC Teaching Materials Improvement

In currently-available ESP reading materials, there is little evidence of a systematic approach to nominal compounds. In view of NC frequency, and the complexity of form and function outlined earlier, this is regrettable. I therefore suggest the following five-stage approach:

1. single-function
2. parallel-function
3. multi-function

4. ellipsis
5. syntactic/polysemous ambiguity

It is not proposed that each stage should be a water-tight compartment, but simply that categories of NC should be treated in increasing order of difficulty. (And naturally there should be constant revision of preceding stages.)

Within each stage, I also suggest a three-stage sequence, viz.

(a) "pointing out"
(b) multiple-choice
(c) free choice

Thus, NCs involved in ellipsis would be treated in the following manner:

	(text extract)	
(a)	In most failure investigations, it should be regarded as an essential routine requirement to check the material properties against those specified, including hardness, tensile and fracture tests, and chemical analysis.	= tests to find out the material's resistance to fracture, and its degree of tensility (stretching) and hardness.
(b)	... it will be possible to evaluate the most urgent areas for slipping research and prevention.	= (a) prevention caused by slipping, and research in order to investigate slipping. (b) the prevention of slipping and research in order to investigate slipping (c) the prevention of slipping, and research represented by slipping
(c)	Examination of the micro-structure will show whether the heat treatment and manufacturing processes for the steel have been correctly executed.	= _____ _____

Finally, the following are general points concerning the teaching of nominal compounds in professional reading:

1. Materials should be set in the reader's specialist area, as "field familiarity" (Olsen and Huckin, 1980) contributes greatly to success in recovery.
2. NCs should always be presented in context, using authentic materials.
3. Ideally, teaching materials should be set out in a workbook format, so

that the student can annotate the text itself. In this way, he has a permanent, composite record of his work. (A workbook format, in turn, suggests a side-on layout, with wide margins.)

4. The goal is free-choice recovery of all categories. The staged approach outlined above is a means to that end.

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